Movement of Atemoya Fruit, *Annona squamosa x A. cherimola*, from Hawaii into other regions of the United States

Qualitative, Pathway-Initiated Pest Risk Assessment

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A. Introduction

This pest risk assessment was prepared by the Animal and Plant Health Inspection Service (APHIS) of the U.S. Department of Agriculture (USDA) to examine plant pest risks associated with the movement into other parts of the United States of **fresh atemoya fruits (*Annona squamosa x A. cherimola*) grown in Hawaii**. This is a qualitative pest risk assessment, that is, estimates of risk are expressed in qualitative terms such as high or low as opposed to numerical terms such as probabilities or frequencies.

International plant protection organizations (*e.g.*, North American Plant Protection Organization (NAPPO), International Plant Protection Convention (IPPC) of the United Nations Food and Agriculture Organization (FAO)) provide guidance for conducting pest risk analyses. The methods used to initiate, conduct, and report this plant pest risk assessment are consistent with guidelines provided by NAPPO, IPPC and FAO. The biological and phytosanitary terms (*e.g.*, introduction, quarantine pest) used in this document conforms with the *NAPPO Compendium of Phytosanitary Terms* (NAPPO 1995) and the *Definitions and Abbreviations* (Introduction Section) in *International Standards for Phytosanitary Measures, Section 1—Import Regulations: Guidelines for Pest Risk Analysis* (FAO 1995).

Pest risk assessment is one component of an overall pest risk analysis. The *Guidelines for Pest Risk Analysis* provided by FAO (1995) describe three stages in pest risk analysis. This document satisfies the requirements of FAO Stages 1 (initiation) and 2 (risk assessment).

The Food and Agriculture Organization (FAO, 1995) defines "pest risk assessment" as "Determination of whether a pest is a quarantine pest and evaluation of its introduction potential". "Quarantine pest" is defined as "A pest of potential economic importance to the area endangered thereby and not yet present there, or present but not widely distributed and being officially controlled" (FAO, 1995; NAPPO, 1995). Thus, pest risk assessments should consider both the likelihood and consequences of introduction of quarantine pests. Both issues are addressed in this qualitative pest risk assessment.

This document presents the findings of our qualitative plant pest risk assessment. The assessment methods or the criteria used to rate the various risk elements have not been described in detail. Details of the methodology and rating criteria can be found in the "template" document: ***Pathway-Initiated Pest Risk Assessment: Guidelines for Qualitative Assessments, version 4.0*** (USDA, 1995); to obtain a copy of the template, contact the individual named in the proposed regulations.

B. Risk Assessment

1. Initiating Event: Proposed Action

This pest risk assessment is commodity-based, and therefore "pathway-initiated"; this assessment was in response to a request for USDA authorization to allow movement of a particular commodity presenting a potential plant pest risk. In this case, the movement of **fresh atemoya fruits (*Annona squamosa x A. cherimola*) grown in Hawaii** into other parts of the U.S. is a potential pathway for introduction of plant pests. Regulatory authority for the movement of fruits and vegetables from Hawaii into other parts of the U.S. is found in 7 CFR §318.13.

Atemoya is a member of the genus *Annona*. There are more than 50 shrubs and trees in the genus, mostly in tropical America, some of which yield important edible fruits. They are of less importance within the region of the U.S. (Bailey, 1949). Several species are grown in Hawaii for their fresh fruits which are eaten raw (Neal, 1965). Species of *Annona* are grown in California, Florida and Texas.

2. Assessment of Weediness Potential of Atemoya, *Annona squamosa x A. cherimola*

Table 1 shows the results of the weediness screening for *Annona squamosa x A. cherimola.* These findings did not require a pest-initiated risk assessment.

Table 1: Process for Determining Weediness Potential of Commodity

Commodity: *Annona squamosa* x *A. cherimola* (Atemoya)

Phase 1: The hybrid is grown in Florida.

Phase 2: Is the species listed in:

NO*	*Geographical Atlas of World Weeds* (Holm, 1979)
NO	*World's Worst Weeds* (Holm, 1977)
NO	*Report of the Technical Committee to Evaluate Noxious Weeds; Exotic Weeds for Federal Noxious Weed Act* (Gunn & Ritchie, 1982)
NO	*Economically Important Foreign Weeds* (Reed, 1977)
NO	Weed Science Society of America list (WSSA, 1989)
NO	Is there any literature reference indicating weediness (*e.g.*, *AGRICOLA*, *CAB*, *Biological Abstracts*, *AGRIS*; search on "species name" combined with "weed").

Phase 3: Conclusion:

* *A. squamosa*, one of the parents of the hybrid, is listed in *Geographical Atlas of World Weeds* as a weed of unknown importance in Cambodia and Jamaica. Because this hybrid is grown in Florida, we proceeded with this pest risk assessment according to our guidelines (USDA, 1995)

3. Previous Risk Assessments, Current Status and Pest Interceptions

3a. Decision history for *Annona* spp.

There are no previous risk assessments (decision sheets) on *Annona* spp. from Hawaii.

3b. Interceptions from Hawaii FY 1985-95 (PINET & 309 Database)

PEST	HOST (PART)	TOTAL
BACTROCERA DORSALIS	FRUIT	1
BACTROCERA DORSALIS	FRUIT	3
BACTROCERA DORSALIS	FRUIT	18
BACTROCERA DORSALIS	FRUIT	14
CERATITIS CAPITATA	FRUIT	1
PSEUDOCOCCIDAE, SPECIES OF	FRUIT	1
PSEUDOCOCCIDAE, SPECIES OF	FRUIT	1
PSEUDOCOCCIDAE, SPECIES OF	FRUIT	1
PSEUDOCOCCIDAE, SPECIES OF	FRUIT	1
TEPHRITIDAE, SPECIES OF	FRUIT	1

4. Pest List: Pests Associated with *Atemoya* in Hawaii

Table 2 shows the pest list for *Annona* spp. which was developed after a review of the information sources listed in USDA (1995). The pest list summarizes information on the distribution of each pest, pest-commodity association, and regulatory history.

Table 2: Pest List - *Annona* spp.

Scientific Name, Classification	Distribution[1]	Comments[2]	References
Pathogens			
Armillaria mellea (Vahl:Fr.) P. Kumm. (Basidiomycetes: Agaricales)	HI,US	a,m,o	Raabe *et. al.*, 1981; Farr *et. al.*, 1989; Wellman, 1977
Botryodiplodia sp. (Fungi Imperfecti: Coelomycetes	HI,US	a,k	Kunishi & Kitagawa, 1996
Colletotrichum gloeosporioides (Penz.) Penz. & Sacc. in Penz. (Fungi Imperfecti: Coelomycetes)	HI,US	a,c,o	Raabe *et. al.*, 1981; Farr *et. al.*, 1989
Colletotrichum sp. (Fungi Imperfecti: Coelomycetes)	HI,US	a,f,k	Kunishi & Kitagawa, 1996; Farr *et. al.*, 1989
Cylindrocladium scoparium Morg. (Fungi Imperfecti: Hyphomycetes)	HI,US	a,m,o	Raabe *et. al.*, 1981; Sanewski, 1991
Cylindrocladium sp. (Fungi Imperfecti: Hyphomycetes)	HI,US	a,k	Kunishi & Kitagawa, 1996; Farr *et. al.*, 1989
Gloeosporium sp. (Fungi Imperfecti: Coelomycetes)	HI,US	k	Kunishi & Kitagawa, 1996; Farr *et. al.*, 1989
Lasiodiplodia theobromae (Pat.) Griffon & Maubl. (Fungi Imperfecti: Coelomycetes)	HI,US	a,c,m,o,z_e	Raabe *et. al.*, 1981; Farr *et. al.*, 1989; Sanewski, 1991

Macrophoma sp. (Fungi Imperfecti: Coelomycetes)	HI,US	k,z_e	Kunishi & Kitagawa, 1996; Farr *et. al.,* 1989
Phoma sp. (Fungi Imperfecti: Coelomycetes)	HI,US	k,z_e	Kunishi & Kitagawa, 1996; Farr *et. al.,* 1989
Phomopsis sp. (Fungi Imperfecti: Coelomycetes)	HI,US	k	Kunishi & Kitagawa, 1996; Farr *et. al.,* 1989
Phytophthora capsici Lionian (Oomycetes: Peronosporales)	HI,US	c,k	Kunishi & Kitagawa, 1996; Farr *et. al.*, 1989
Pseudomonas solanacearum (Smith) Smith	HI,US	a,o	Sanewski, 1991; Bradbury, 1986
Pythium splendens H. Braun (Oomycetes: Peronosporales)	HI,US	a,c,m,o	Raabe *et. al.,* 1981; Farr *et. al.,* 1989; Alfieri *et. al.*, 1994; Wellman, 1977
Rhizoctonia solani Kuhn (Fungi Imperfecti: Agonomycetes)	HI,US	a,c,m,o	Raabe *et. al.,* 1981; Farr *et. al.,* 1989; Wellman, 1977
Rhizopus stolonifer (Ehrenb.:Fr.) Vuill. (Zygomycetes: Mucorales)	HI,US	a,o	Sanewski, 1991; Raabe *et. al.,* 1981; Farr *et. al.,* 1989
Arthropods			
Abgrallaspis cyanophylli (Signoret) (Homoptera: Diaspididae)	HI,US	c,o	Anon., 1994; Pena & Bennett, 1995; Nakahara, 1982; Kunishi & Kitagawa, 1996
Aleurodicus dispersus Russell (Homoptera: Aleyrodidae)	HI,FL	a,g,m	Anon.,1994; Pena & Bennett, 1995; Mound, 1978; CIE, 1986
Aleurothrixus floccosus (Maskell) (Homoptera: Aleyrodidae)	HI,CA,FL	a,c,m,o	Anon., 1994; Pena & Bennett, 1995; Debach & Rose, 1976
Anacamptodes fragilaria (Grossbeck) (Lepidoptera: Geometridae)	HI,CA	c,o	Kunishi & Kitagawa, 1996; Zhang, 1994
Aphis gossypii Glover (Homoptera: Aphididae)	Worldwide	a,c,m,o,y	Blackman & Eastop, 1984; CIE, 1968
Aphis spiraecola Patch (Homoptera: Aphididae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; CIE, 1969c
Aspidiotus destructor Signoret (Homoptera: Diaspididae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; Nakahara, 1982
Aspidiotus nerii Bouche (Homoptera: Diaspididae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; CIE, 1970; Nakahara, 1982
Bactrocera dorsalis Hendel (Diptera: Tephritidae)	HI,US_3	h,z_i	White, 1992
Bactrocera cucurbitae Coquillet (Diptera: Tephritidae)	HI,US_3	h,z_i	White, 1992
Bephratelloides cubensis (Ashmead) (Hymenoptera: Eurytomidae)	HI,FL	c,z_i	Anon, 1994; Nadel & Pena, 1991

Ceratitis capitata (Wiedemann) (Diptera: Tephritidae)	HI,US$_3$	h,z$_i$	White, 1992
Ceroplastes cirripediformis Comstock (Homoptera: Coccidae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; Gimpel *et. al.,* 1974
Ceroplastes rubens Maskell (Homoptera: Coccidae)	HI	m,z$_e$	USDA, 1996
Chrysomphalus aonidum (L.) (Homoptera: Diaspididae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; CIE, 1951; Nakahara, 1982
Chrysomphalus dictyospermi (Morgan) (Homoptera: Diaspididae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; CIE, 1969; Nakahara, 1982
Coccus hesperidum L. (Homoptera: Coccidae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; CIE, 1972
Coccus longulus (Douglas) (Homoptera: Coccidae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995
Coccus viridis (Green) (Homoptera: Coccidae)	HI,FL	h	Anon., 1994; Pena & Bennett, 1995; CIE, 1972a; Kunishi & Kitagawa, 1996
Conchaspis angraeci Cockerell (Homoptera: Conchaspididae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995
Dysmicoccus neobrevipes (Cockerell) (Homoptera: Pseudococcidae)	HI,FL	g,m,x,y,z$_e$	Anon. 1994; Pena & Bennett, 1995; Harris & Maramorosch, 1980; Blackburn, 1988; USDA, 1996
Eucalymnatus tessellatus (Signoret) (Homoptera: Coccidae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; CIE, 1982a; Metcalf & Metcalf, 1993
Ferrisia virgata (Cockerell) (Homoptera: Pseudococcidae)	HI,US	c,m,o,y,z$_e$	Anon., 1994; Pena & Bennett, 1995; CIE, 1966
Heliothrips haemorrhoidalis (Bouche) (Thysanoptera: Thripidae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; CIE, 1961a
Hemiberlesia lataniae (Signoret) (Homoptera: Diaspididae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; CIE, 1976; Nakahara, 1982
Hemiberlesia rapax (Comstock) (Homoptera: Diaspididae)	HI,US	c,o	Kunishi & Kitagawa, 1996
Howardia biclavis Comstock (Homoptera: Diaspididae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; CIE, 1957; Nakahara, 1982
Hypothenemus sp. prob. *obscurus* (Essig) (Coleoptera: Scolytidae)	HI,US	e	Kunishi & Kitagawa, 1996
Icerya purchasi Maskell (Homoptera: Margarodidae	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; CIE, 1971

Ischnaspis longirostris (Signoret) (Homoptera: Diaspididae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; Nakahara, 1982
Lepidosaphes beckii (Newman) (Homoptera: Diaspididae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; CIE, 1982; Nakahara, 1982
Maconellicoccus hirsutus (Green) (Homoptera: Pseudococcidae)	HI	m,x,z_e	USDA, 1996
Macrosiphum euphorbiae (Thomas) (Homoptera: Aphididae)	HI,US	c,m,o,y	Anon., 1994; Pena & Bennett, 1995; CIE, 1984, Harris & Maramorosch, 1980
Mycetaspis personata (Comstock) (Homoptera: Diaspididae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; Nakahara, 1982
Nipaecoccus nipae (Maskell) (Homoptera: Pseudococcidae)	HI,CA,FL,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; CIE, 1966a
Parasaissetia nigra (Nietner) (Homoptera: Coccidae)	HI,US	c,m,o,z_e	Anon., 1994; Pena & Bennett, 1995; Sanewski, 1991
Pinnaspis aspidistrae (Signoret) (Homoptera: Diaspididae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; CIE, 1977; Nakahara, 1982
Pinnaspis strachani (Cooley) (Homoptera: Diaspididae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995
Planococcus citri (Risso) (Homoptera: Pseudococcidae)	HI,US	c,o,y,z_e	Anon., 1994; Pena & Bennett, 1995; CIE, 1969b; Metcalf & Metcalf 1993; Harris & Maramorosch, 1980; Sanewski, 1991; Kunishi & Kitagawa, 1996
Pseudococcus elisae Borchsenius (Homoptera: Pseudococcidae)	HI,US	c,m	Williams & Willink, 1992; Anon., 1994
Pseudococcus longispinus (Targioni-Tozzetti) (Homoptera: Pseudococcidae)	HI,US	c,m,o,y	Anon., 1994; Pena & Bennett, 1995; CIE, 1984a; Metcalf & Metcalf, 1993; Harris & Maramorosch, 1980
Pseudonirvana rufofascia (Kuoh and Kuoh) (Homoptera: Nirvanidae)	HI	e	Kunishi & Kitagawa, 1996
Pulvinaria psidii Maskell (Homoptera: Coccidae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; CIE, 1994
Pulvinaria urbicola Cockerell (Homoptera: Coccidae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995
Saissetia coffeae (Walker) (Homoptera: Coccidae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; CIE, 1973
Saissetia oleae (Olivier) (Homoptera: Coccidae)	HI,US	c,m,o	Anon., 1994; Pena & Bennett, 1995; CIE, 1952

Selenothrips rubrocintus (Giard) (Thysanoptera: Thripidae)	HI,FL	c,m	Anon., 1994; Pena & Bennett, 1995; CIE, 1961b
Tetranychus urticae Koch (Acari: Tetranychidae)	HI,US	z_e	Sanewski, 1991; Anon, 1994
Thrips hawaiiensis (Morgan) (Thysanoptera: Thripidae)	HI,US	a,c,e,o	Nakahara, 1994; CIE, 1983
Thrips tabaci Lindeman (Thysanoptera: Thripidae)	HI,US	a,c,e,o,y	Nakahara, 1994; CIE, 1969a; Harris Maramorosch, 1980
Toxoptera aurantii (Boyer de Fonscolombe) (Homoptera: Aphididae)	HI,US	a,c,o,y	Blackman & Eastop, 1994; Anon., 1994; CIE, 1961

[1] Distribution legend: HI = Hawaii; US = Other parts of the United States; CA = California; FL = Florida; TX = Texas

[2] Comments:
- a = Pest mainly associated with a plant part other than the commodity.
- c = Listed in non-reportable dictionary as non-actionable.
- e = Although pest attacks commodity, it would not be expected to remain with the commodity during processing.
- f = Pest occurs in the U.S. and is not subject to official restrictions and regulations.
- g = Quarantine pest, pest has limited distribution in the U.S. and is under official control as follows; pest listed by name in USDA's pest dictionary, official quarantine action may be taken on this pest when intercepted on this commodity.
- h = Quarantine pest: pest has limited distribution in the U.S. and is under official control as follows: (1) pest listed by name in USDA's pest distionary, (2) pest is a program pest.
- k = Not specifically listed for host, but reported from other hosts in the same genus.
- m = The pest occurs within the PRA area and has been reported to attack the genus in other geographic regions; but has not been reported to attack the genus in the PRA area.
- o = Pest does not meet the geographic or regulatory definition of a quarantine pest.
- x = Multiple interception records exist.
- y = Pest is a vector of plant pathogens.
- z_e = External pest: is known to attack or infest fruits of *Annona* spp. and it would be reasonable to expect the pest may remain with the commodity during processing and shipping.
- z_i = Internal pest: is known to attack or infest fruits of *Annona* spp. and it would be reasonable to expect the pest may remain with the commodity during processing and shipping.

3 *Bactrocera cucurbitae, B. dorsalis, and Ceratitis capitata* have been detected on occassion in the Unites States. Whenever they are detected, a quarantine is established and an eradication program implemented. These fruit flies are considered to be quarantine pests in the United States.

5. List of Quarantine Pests

The list of quarantine pests for commercial shipments of atemoya fruits from Hawaii is provided in Table 3. Should any of these pests be intercepted on commercial (or any other) shipments of atemoya, quarantine action will be taken.

Table 3: Quarantine Pests: Atemoya fruits consumption	
Arthropods	*Aleurodicus dispersus* Russell
	Bactrocera dorsalis Hendel
	Bactrocera cucurbitae Coquillet
	Ceratitis capitata (Wiedemann)
	Ceroplastes rubens Maskell
	Coccus viridis (Green)
	Dysmicoccus neobrevipes (Cockerell)
	Maconellicoccus hirsutus (Green)

6. Quarantine Pests Likely to Follow Pathway (*i.e.*, Quarantine Pests Selected for Further Analysis)

Only those quarantine pests that could reasonably be expected to follow the pathway, *i.e.*, be included in commercial shipments of atemoya fruits were analyzed in detail (see USDA, 1995 for selection criteria). Only quarantine pest listed in Table 4 were selected for further analysis and subjected to steps 7-9 below. Although *Ceroplastes rubens*, *Dysmicoccus neobrevipes* and *Maconellicoccus hirsutus* have not been associated with annona in Hawaii, they have been intercepted on fruits from other tropical areas so they were included for further evaluation.

Table 4: Quarantine Pest Selected for Further Analysis: Hawaiian Atemoya Fruits for consumption	
Arthropods	*Bactrocera dorsalis*
	Bactrocera curcurbitae
	Ceratitis capitata
	Ceroplastes rubens
	Dysmicoccus neobrevipes
	Maconellicoccus hirsutus

7. Economic Importance: Consequences of Introduction

The consequences of introduction was considered for each quarantine pest selected for further analysis. For qualitative, pathway-initiated pest risk assessments, these risks are estimated by rating each pest with respect to five risk elements. A full description of these elements and rating criteria can be found in USDA (1995). Table 5 shows the risk ratings for these risk elements.

Table 5: Risk Rating: Consequences of Introduction

Pest	Climate/ Host	Host Range	Dispersal	Economic	Environ-mental	Risk Rating
Bactrocera dorsalis	high	high	high	high	high	high
Bactrocera cucurbitae	high	high	high	high	high	high
Ceratitis capitata	high	high	high	high	high	high
Ceroplastes rubens	high	high	low	medium	medium	medium
Dysmicoccus neobrevipes	low	high	low	medium	medium	medium
Maconellicoccus hirsutus	medium	high	medium	high	high	high

8. Likelihood of Introduction

Each pest was rated with respect to introduction potential (*i.e.*, entry and establishment). Two separate components were considered. First, the amount of commodity likely to be moved was estimated. More movement leads to greater risk; the result is a risk rating (0, 1, or 2) that applies to the commodity and country in question and is the same for all quarantine pest considered. Second, five biological features *i.e.* risk elements, concerning the pest and its interactions with the commodity were considered. The resulting risk ratings were specific to each pest. Details of elements and rating criteria can be found in USDA (1995). The cumulative risk rating for introduction was considered to be an indicator of the likelihood that a particular pest would be introduced. Table 6 shows the ratings for these risk elements.

Table 6: Risk Rating: Likelihood of Introduction

Pest	Quantity of commodity imported annually	Likelihood survive postharvest treatment	Likelihood survive shipment	Likelihood not detected at port of entry	Likelihood moved to suitable habitat	Likeli-hood find suit-able host	Risk rating
Bactrocera dorsalis	low	high	high	high	high	low	high
Bactrocera cucurbitae	low	high	high	high	high	low	high
Ceratitis capitata	low	high	high	high	high	low	high
Ceroplastes rubens	low	high	high	medium	low	high	medium
Dysmicoccus neobrevipes	low	high	high	medium	medium	medium	medium
Maconellicoccus hirsutus	low	high	high	medium	low	low	medium

9. Conclusion: Pest Risk Potential and Phytosanitary Measures

The measure of pest risk potential combines the risk ratings for consequences and likelihood of introduction as described in USDA (1995). Table 7 shows the estimated pest risk potential for the quarantine pests selected for further analysis for the movement of atemoya fruits from Hawaii.

Table 7: Pest Risk Potential, Quarantine Pests, *Annona squamosa x A. cherimola*

Pest	Pest risk potential
Bactrocera dorsalis	high
Bactrocera cucurbitae	high
Ceratitis capitata	high
Ceroplastes rubens	medium
Dysmicoccus neobrevipes	medium
Maconellicoccus hirsutus	high

For those pests, except *M. hirsutus*, receiving a high PRP risk rating, we recommend specific phytosanitary measures be implemented, port-of-entry inspection is not considered sufficient to provide phytosanitary security. *M. hirsutus* has not been associated with *Annona* in Hawaii and therefore movement of fruit is unlikely to serve as a pathway for introduction. Although *M. hirsutus* is established in Hawaii it has had little or no impact, probably due to the introduction of a parasite about the same time. PPQ currently inspects other commodities which serve as hosts for this mealybug from the Caribbean area. If this mealybug is intercepted on *Annona* fruits, Operational Support staff may establish appropriate sanitary and phytosanitary measures they believe necessary to mitigate pest risk. The pest risk management phase of the PRA is not part of this document. Appropriate sanitary and phytosanitary measures to mitigate pest risk will be determined during the pest risk management phase.

PPQ has intercepted over 600 pests on fruits of *Annona* spp. from other areas of the world; however, virtually all external pests listed could be detected by inspection. Some of these same pests occur in Hawaii in addition to other quarantine pests and have been intercepted as hitchhikers with other commodities. Should any of these pests be intercepted on commercial (or any other) shipments of atemoya, quarantine action may be taken.

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